Gas Laws Practice Problems

Draw graph representations of Boyles, Charles, and Gay-Lussac’s Laws. Include labeling the axes with units.

1. Some oxygen occupies 250 ml when the barometer reads 100 kPa. How many kPa will it occupy when the volume is reduced to 240 ml? (104.17 kPa)

2. A gas collected when the pressure is 200 kPa has a volume of 380 ml. What volume will the gas occupy at standard pressure? (750.06 ml)

3. If 100 ml of hydrogen gas is collected when the temperature is 27°C, how many ml will hydrogen occupy at 46°C? (106.33 ml)

4. What temperature must 600 ml of a gas at 20°C be changed to lower its volume to 540 ml? (263.70 K)

5. If the temperature is 23°C and the pressure is standard, what will be the temperature if the pressure is raised to 780 mm Hg? (303.94 K)

6. If at STP, the temperature is changed to 50°C, what will be the new pressure?

(1.18 atm, 119.87 kPa, 899.12 mm Hg)

7. A gas has a volume of 12 ml and pressure of 80 kPa at 27°C. Calculate the temperature at 50 ml and 120 kPa. (1875 K)

8. A gas has a volume of 80 ml and a pressure of 130 kPa at 40°C. Calculate the pressure at 45 ml and 60°C. (245.88 kPa)

9. What is the ratio of the speed of nitrogen molecules to that of oxygen molecules when both gases are at the same temperature? Remember that both elements are diatomic. (1.07:1)

10. What is the ratio of the speed of carbon monoxide molecules to that of carbon dioxide molecules when both gases are at the same temperature? (1.25:1)

11. What would be the volume of 28 g CH4 at standard pressure and temperature? Note: you will need to change grams to moles. (38.97 L)

12. What volume must be maintained to ensure that 2.1 atm of a 0.75 mole gas at -10°C is stable? (7.71 L or dm3)

13. Calculate the mass of 856 ml of hydrogen sulfide at STP. (1.302 g)

14. The density of chlorine is 3.214 g/L at STP. Calculate its molecular mass. (71.99 g/mol)

15. Draw a picture of a manometer with the following conditions and calculate the pressure of the gas inside the manometer. The mercury level in the tube is 12 mm higher than that outside? The barometer reads 720 mm. (708 mm Hg)

16. Draw a picture of a manometer with the following conditions and calculate the pressure of the gas inside the manometer. T he mercury level in the tube is 10 mm lower than that outside? The barometer reads 680 mm. (690 mm Hg)

17. The volume of oxygen in an eudiometer is 44 ml. The mercury level inside the tube is 25 mm higher than that outside. The barometer reading is 760 mm. The temperature is 24°C. What will be the volume of the oxygen at STP? (39.11 ml)

18. Some nitrogen is collected by displacement of water in a gas measuring tube. The gas volume is 30 ml. The liquid inside and outside the tube are the same. The temperature is 30°C and the pressure is 750 mm. Convert the volume to that of dry gas at STP. (25.54 ml)

Explain the following phenomena

1. Why did the colored water rise up in the Erlenmeyer flask and the candle extinguish?

2. Why did the index card stay on the water filled Erlenmeyer flask when turned upside down?

3. Why does the hardboiled egg get sucked into the bottle when some lit paper is placed inside the container.

4. Why does the hardboiled egg come out of the bottle when you blow air into the container?

5. Why does the soda can implode when you steam is coming out the top and you invert the can into some cold water?

6. Why does the balloon get bigger when placed it in the bell jar on the vacuum pump?

7. Why does the shaving cream increase in size when it is placed under the bell jar in the vacuum pump?

8. Why does the marshmallow increase in size when it is placed under the bell jar in the vacuum pump?